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(दूसरा पुनरीक्षण)

Indian Standard

FLUX CORED SOLDER WIRE — SPECIFICATION

(Second Revision)

ICS 25.160.50; 77.120.60

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 2005

Price Group 4

Lead, Zinc, Cadmium, Tin, Antimony and Their Alloys Sectional Committee, MTD 9

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lead, Zinc, Cadmium, Tin, Antimony and Their Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1961, subsequently revised in 1975. While reviewing this standard in the light of experience gained during these years, the Committee decided to revise it to bring it in line with the present practices followed by the Indian industry.

In this revision following changes have been made:

a) Title of the standard has been changed to Flux cored solder wire — Specification,
b) Clause on reference of Indian Standard has been updated;
c) Total of other impurities given in the Note under Table 1 have been limited to 0.08 percent;
d) Clause on marking has been modified; and
e) Figures 1 to 3 have been incorporated.

Melting characteristics and typical uses of flux cored solders are given for information in Annex A.

Lead is known to be one of the toxic material directly responsible for many present day diseases and body poisoning. The levels of toxicants like lead are very high in the vicinity where soft/solder/solder wire are being manufactured. Therefore, utmost care is required to be taken to minimize the lead in work place air, ambient air and in the industrial effluents.

For the purpose of deciding whether particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FLUX CORED SOLDER WIRE — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers requirements for rosin/no clean flux cored solder wire either activated or non-activated (non-corrosive) of circular cross-section having a single or multiple continuous core of flux.

2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
170 : 1986	Specification for acetone (*third revision*)
264 : 1976	Nitric acid (*second revision*)
324 : 1959	Specification for ordinary denatured spirit
336 : 1973	Specification for ether (*second revision*)
354 (Part 2) : 1986	Methods of sampling and test for resin for paints: Part 2 Special test methods for alkyd resins (*second revision*)
534 : 1992	Benzene — Specification (*third revision*)
715	Specification for coated abrasives:
(Part 1) : 1976	General applications (*third revision*)
(Part 2) : 1976	Special and mechanized applications (*third revision*)
998	Methods of chemical analysis of soft solder (soft and rosin cored):
(Part 1) : 1983	Determination of tin and antimony (*first revision*)
(Part 2) : 1983	Determination of iron, copper and arsenic (*first revision*)
(Part 3) : 1983	Determination of cadmium, zinc, aluminium, bismuth and nickel (*first revision*)
1070 : 1992	Reagent grade water (*third revision*)
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
1897 : 1983	Copper strip for electrical purposes (*second revision*)

3 SUPPLY OF MATERIAL

General requirements relating to the supply of rosin/no clean flux cored solder wire shall be as laid down in IS 1387.

4 CHEMICAL COMPOSITION

The solder when chemically analyzed by the method specified in the relevant parts of IS 998 or any other established instrumental/chemical method shall be as given in Table 1. In case of dispute, the procedure given in relevant parts of IS 998 shall be the referee method. However, where the method is not given in the relevant parts of IS 998, the referee method shall be as agreed to between the purchaser and the manufacturer.

5 FLUX

5.1 Types

The core material shall be of two types, namely activated and non-activated.

5.1.1 *Activated*

Wood or gum rosin/no clean flux shall contain an activating agent evenly distributed therein. Unless agreed to between the purchaser and the supplier, the activated rosin shall contain not more than 0.5 percent by mass of halogen, calculated as chlorine (*see* **B-2.4**). The mass of rosin in the core shall be not less than 2 percent and not more than 4 percent of total mass of cored solder (*see* **B-2.3.1**).

5.1.2 *Non-activated*

This shall be wood or gum rosin/no clean flux only. The mass of the rosin in the core or cores shall be not less than 2 percent and not more than 4 percent of the total mass of cored solder. The acid value of the rosin when tested according to method given in **14** of IS 354 (Part 2) shall be not less than 160 mg KOH/g. A test to distinguish activated from non-activated rosin-cored solder in given in Annex B.

5.3 General Requirements

The flux shall be homogeneous and uniformly distributed throughout the longitudinal axis of the solder. The flux core in case of a single core shall be concentric and in case of multiple cores shall symmetrically spaced about the longitudinal axis. The flux shall be permanently contained under normal condition of storage. It shall be free from defects and ingredients which may affect the service of the solder joint and toxic affect on persons using it.

6 FLUX RESIDUES

6.1 Hardening

Flux residue at a specimen joint made with the cored solder wire shall harden at such a rate that when examined after an interval of not more than 30 min.

a) The residue shall not be readily indented by the finger nail, and

b) Powdered chalk or cotton wool when applied may be readily removed by light brushing.

6.2 Freedom from Corrosive Action

When tested according to the method given in Annex C, the flux shall be free from corrosive action.

7 DIMENSIONS

7.1 The flux cored solder wire shall normally be supplied in the following sizes:

Diameter mm	*Tolerance* mm
0.50	± 0.05
0.63	
0.80	
1.00	± 0.1
1.25	
1.50	
2.00	
2.50	
3.15	

7.2 Any other size may also be supplied by agreement between the manufacturer and the purchaser.

8 SAMPLING FOR TESTS

8.1 Unless otherwise agreed to between the manufacturer and the purchaser, the manufacturer shall not be called upon to furnish the exact content of impurities or quantitative data concerning the test results for every batch or delivery. But for tests, the purchaser or his representative may select sufficient quantity considered necessary for carrying out the tests. The quantity of samples selected shall not exceed one percent of the total number of coils or reels of any one nominal size of solder ordered. For orders of less than 100 coils or reels of any one nominal size of solder wire, sufficient quantity not exceeding one coil or reel may be selected. Coils or reels so selected shall be accepted as part of the delivery.

9 RETEST AND REJECTION

9.1 If a sample selected for testing fails to meet the specified requirements, the purchaser or his representative shall select two more samples from the same lot. If on testing either of these samples fails to meet the specified requirements, the lot may be rejected. In case of dispute or in the absence of agreement, either party shall have the right to have the solder sampled and tested by an independent authority mutually agreed upon and its decision shall be binding.

10 PACKING

Each coil of the cored solder wire shall be suitably packed in cartons. Reels shall be wrapped in paper in such a way that the solder is not exposed. The cartons containing the coils or the reels shall then be packed in wooden cases to facilitate ease in transport and prevent damage in transit.

11 MARKING

11.1 Each carton containing the coil or each reel shall be suitably marked indicating:

a) Manufacturer's name or trade-mark;

b) Grade of solder;

c) Nominal size of the wire;

d) Type of flux — whether activated or non-activated;

e) Batch or lot no.; and

f) Net mass.

11.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

11.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 1 Chemical Composition of Solders Used for Flux Cored Solder Wire

(*Clause* 4)

Sl No.	Grade	Alloying Element Percent		Impurities, Percent, *Max*			
		Sn	Pb	Sb	Cu	As	Fe
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	60	60 ± 0.5 %	Remainder	0.2	0.05	0.05	0.02
ii)	50	50 ± 0.5 %					
iii)	40	40 ± 0.5 %					
iv)	35	35 ± 0.5 %					
v)	20	20 ± 0.5 %					

NOTE — Total of other impurities namely, Al, Zn or Cd shall be limited to 0.08 percent as their presence is harmful.

ANNEX A

(*Foreword*)

MELTING CHARACTERISTICS AND TYPICAL USES OF FLUX CORED SOLDERS

(*For Information Only*)

Sl No.	*Grade*	*Limits of Melting Range, °C*	*Melting Characteristics*	*Typical Uses*
(1)	(2)	(3)	(4)	(5)
i)	60	183-188	Melting sharply at lowest temperature of the series	Electrical, radio, telephone instrument assemblies liable in damage by heat or requiring free running solder.
ii)	50	183-212	Melting points slightly short higher than above with melting range	Electrical, radio, telephone and instrument work where a slightly higher temperature and some slight loss of penetrating general hand assembly. Hand-soldering medium gauge tinsmiths and copper smith's work.
iii)	40	183-23	Melting points still higher and pronounced melting range	Tagging components less liable to damage by heat. Tinsmiths' and copper-smith's light gauge hand - work
iv)	35	183-247		
v)	20	183-276	Higher melting point of the series with long melting range	Blobbing electric lamp contacts

ANNEX B

(*Clause* 5.1.2)

METHODS OF TEST FOR ROSIN FLUX (CORE)

B-1 TEST TO DISTINGUISH ACTIVATED FROM NON-ACTIVATED FLUX CORED SOLDER WIRE

B-1.0 Principle

A specimen of the solder wire is melted on a prepared inclined nickel square under defined conditions. For the test to be valid, it is essential that the solder should melt within a period of 2 to 6 s.

The flux shall be judged to be activated, if the solder on melting wets the nickel and spreads upon its surface.

B-1.1 Preparation of Test Specimens

From each reel or coil representing the consignment, cut specimens and bend them into U-shape around a mandrel of 3 mm in diameter, those from solder wire 2 mm diameter and thicker, being 20 mm long and those from wire thinner than 2 mm, being 15 mm long.

B-1.2 Test Squares

Test squares shall be flat, 40 mm square, and cut from bright cold-rolled and annealed nickel sheet 0.25 to 0.30 mm thick.

B-1.2.1 Prepare each test square by first degreasing with a solvent such as acetone or benzene (*see* IS 170 and IS 534) followed by polishing with emery paper [*see* IS 715 (Parts 1 and 2)]. The specimen of solder shall also be degreased. Do not handle the surface and polishing.

B-1.2.2 Mount the test square at an angle of 15 ± 1° from the horizontal (*see* Fig.1 and Fig. 2). Use a new square for each test.

B-1.3 Procedure

Melt the solder wire either by gas-heating or by electric-heating as given below.

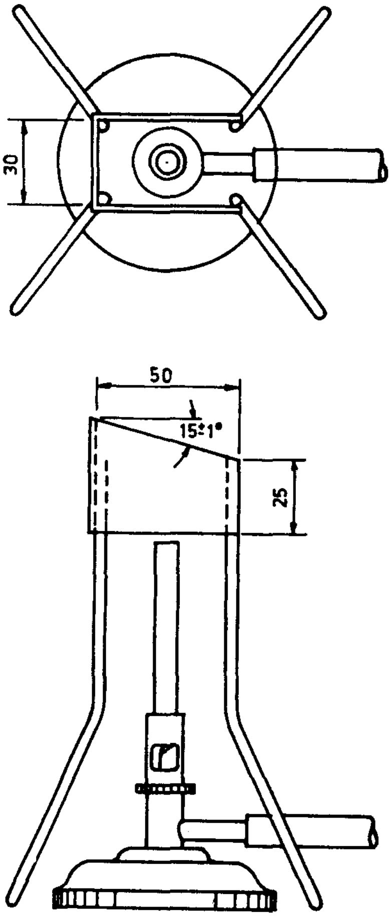
B-1.3.1 *Gas Heating*

Place the test square with the ends of the solder specimen pointing downwards upon it on a suitable stand (*see* Fig.1). Bring a Bunsen burner under the test square and observe the melting of the solder specimen. If the solder does not melt within a period of 2 to 6 s from the moment heat is applied, the test shall be deemed to be invalid and shall be repeated.

B-1.3.1.1 Preliminary test should be carried out to obtain the correct adjustment of Bunsen flame.

B-1.3.2 *Electric Heating*

Bring an inclined electrically-heated block (*see* Fig. 2) to equilibrium temperature. This shall take about half-an-hour in open air, or less time if covered with a piece of asbestos. Place the nickel square upon it and within 1 min place the solders specimen upon the square ends downwards.



All dimensions in millimetres.

FIG. 1 GAS-HEATED STAND FOR TEST SQUARE

B-1.3.2.1 If the solder does not melt within 2 to 6 s from the moment the specimen is placed on the square, the test shall be deemed to be invalid and shall be repeated, the energy input to the heater being adjusted, if necessary.

B-1.4 Assessment of Results

If the test fails to give a positive result, three further tests shall be made on specimens from the same coil or reel.

The flux shall be deemed to be activated if all the three re-tests are positive.

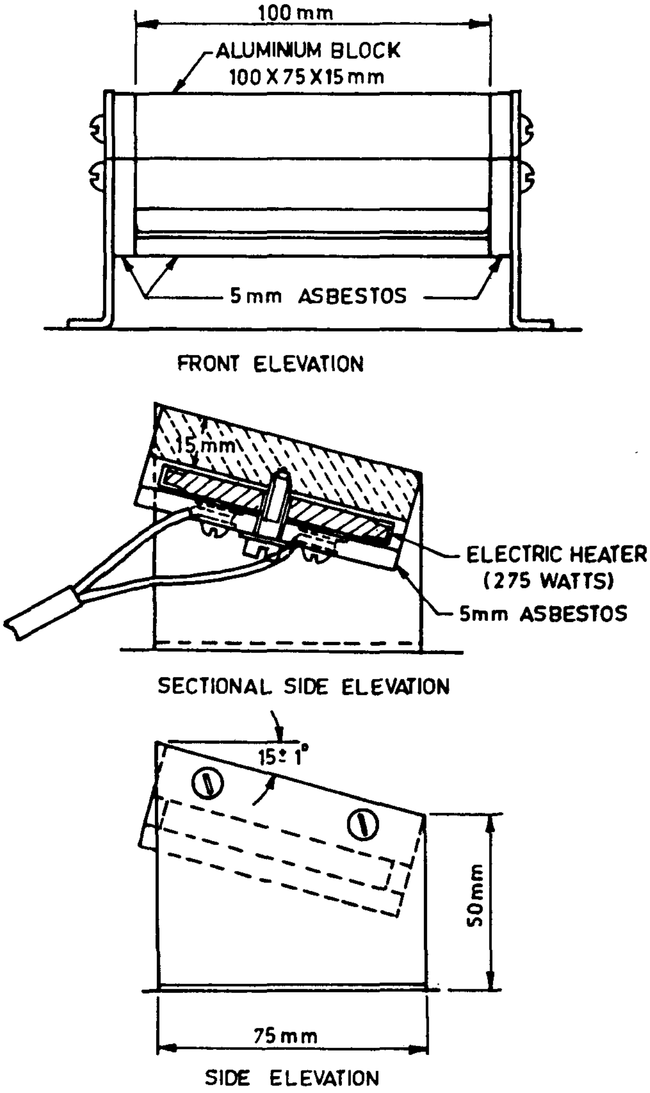


FIG. 2 ELECTRICALLY-HEATED BLOCK

B-2 DETERMINATION OF HALOGEN IN ROSIN CORE

B-2.1 Quality of Reagents

B-2.1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in the tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the result of analysis.

B-2.2 Reagents

B-2.2.1 *Denatured Spirit* — Conforming to IS 324.

B-2.2.2 *Benzene* — Conforming to IS 534.

B-2.2.3 *Ether* — Conforming to IS 336.

B-2.2.4 *Standard Silver Nitrate Solution* — 0.02 N.

B-2.2.5 *Concentrated Nitric Acid* — Conforming to IS 264.

B-2.2.6 *Nitrobenzene*

B-2.2.7 *Ferric Alum Indicator* — A cold saturated solution of ferric alum decolorized by the addition of a small quantity nitric acid.

B-2.2.8 *Standard Potassium Thiocyanate Solution* — 0.02 N Standardize this solution against 0.02 N silver nitrate solution.

B-2.3 Procedure

B-2.3.1 Cut sufficient solder into pieces 5 mm long, to produce a mass of about 2 g of rosin, and weigh accurately. Reflux in a flask fitted with a condenser with 50 ml of the denatured spirit adding these washings to the extract. Dry the solder at 110°C for 1h, reweigh and obtain the mass of the rosin by difference. Alternatively, extraction may be done by means of a Soxhlet apparatus.

B-2.3.2 Evaporate the rosin solution to 10 ml. Transfer to a separating funnel, wash the beaker with 5 ml of denatured spirit and then with 25 ml of diethyl ether or benzene. Combine the solution and the washings and extract the denatured spirit/solvent solution with two 50-ml portions of distilled water or more if necessary and combine the two extracts.

B-2.3.3 Add 25 ml of standard silver nitrate solution by pipette, 5 ml of concentrated nitric acid and coagulate the precipitate by swirling with 5 ml of nitrobenzene. Add 1 ml of ferric alum indicator and titrate with standard potassium thiocyanate solution to a faint, permanent red end point. Carry out a blank determination.

B-2.4 Calculation

Halogen (as chlorine), percent =

$$\frac{(A - B)\, N \times 0.035\,46}{C} \times 100$$

where

A = volume, in ml, of the standard potassium thiocyanate solution required for the blank;

B = volume, in ml, of the standard potassium thiocyanate solution required for the rosin solution;

N = normality of the standard potassium thiocyanate solution; and

C = mass, in g, of the rosin taken.

ANNEX C

(*Clause* 6.2)

TEST FOR FREEDOM FROM CORROSIVE ACTION OF FLUX RESIDUE

C-1 QUALITY OF REAGENTS

C-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in the tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

C-2 REAGENTS

C-2.1 Acetone — Conforming to IS 170.

C-2.2 Benzene — Conforming to IS 534.

C-3 PROCEDURE

C-3.1 Preparation of Test Assembly

Cut two pieces of copper sheet (half-hard condition) complying with IS 1897 approximately to 65 × 70 × 0.5 mm. Clean pieces with emery paper [*see* IS 715 (Parts 1 and 2)].

C-3.1.1 Make a depression in one piece to form the lower element of the test assembly. This depression may conveniently be made on the Erichsen cupping machine, using the P. 3A tool, producing a cup of 3 mm depth. Bend the short edges to form flanges 5 mm deep and 50 mm long and assemble the two elements to form an open-ended box as shown in Fig. 3.

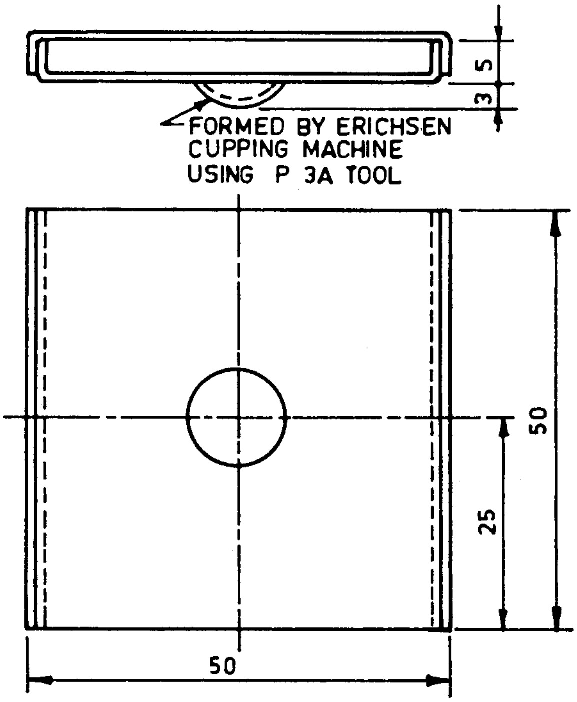
C-3.1.2 Immediately before use, re-clean with fine emery paper (*see* IS 715) and degrease the assembly thoroughly with a swab of cotton wool soaked in a solvent, such as acetone or benzene. After cleaning it, place in the depression about 1g of the cored solder formed into a flat spiral. Replace the top element, and keeping the sheet in a horizontal position, heat the lower side of the depression, through a suitable metal block kept by any convenient means at a temperature of 60°C above the nominal liquidus of the solder under test. The heat shall be applied only until the solder melts and spreads; then remove the test assembly from the block.

C-3.2 Humidity Test at Controlled Temperature

Allow the test assemblies prepared under **C-3.1** to cool for 1h. Place them in a vertical position in a humidity cabinet, consisting of a glass vessel with a lid (for example, a desicator) containing distilled water, maintained at temperature of 45 ± 2 °C. Hold the samples under these conditions for 48 h and at the end of this period, examine both pieces of copper sheet and the flux residue for evidence of corrosive action.

C-3.3 Assessment of Freedom from Corrosion

The flux residues shall be judged free from corrosive action if the test pieces, when examined visually at a magnification of between five and ten diameters, show no signs of formation of a greenish corrosion product at the edges of the flux residue or pitting of the copper sheet. The presence of a yellowish green colouration formed within the flux during fusion, or of khaki-coloured opacity developed during the test due to moisture absorption, shall not be deemed a fault, and such colouration or opacity shall not constitute non-compliance with the requirements of this specification.



All dimensions in millimetres.

FIG. 3 HUMIDITY TEST ASSEMBLY

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